NORTON SOUND WEIR SITES INVESTIGATION PROJECT

By

Jim Menard

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AUTHOR

Jim Menard is the Norton Sound/Kotzebue Area Manager for the Alaska Department of Fish and Game, Commercial Fisheries Division, Pouch 1148, 320 E. Front Street, Nome, AK 99762-1148.

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OEO/ADA STATEMENT

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICIES

ABSTRACT

Ten rivers were surveyed in the Norton Sound area to locate feasible sites to operate a resistance-board "floating" weir to enumerate adult salmon returns. On four rivers, Tubutulik, Kwiniuk, Sinuk, and Niukluk, there was at least one site that rated as very good for the potential success of a resistance-board weir. Also, four rivers, Unalakleet, North, Tubutulik, and Pilgrim, had at a site that was rated as good for the potential success of a resistance-board weir. Other rivers surveyed were the Nome, Eldorado, and Snake. The costs of a weir for each river site were estimated relative to FOB Nome costs and the width of the river at the site. Of the sites that received a very good rating weir material costs ranged from $25,400 at the Kwiniuk River site number 1 to $52,280 at the Tubutulik River site number 3. To construct each weir approximately $41,000 in labor and other fixed costs would need to be added to the weir material costs. Other factors to be considered in placing a resistance-board weir at a site would include transportation costs from Nome and determining how many salmon would spawn below the weir site. The first resistance-board weir project was recommended to be on the Sinuk River and the second project recommendation was on the Pilgrim River. The recommendation for a project to be on the Sinuk River or Pilgrim River was because of the favorable site survey ratings, and limited escapement data from these rivers.

INTRODUCTION

The Norton Sound Salmon Management District includes all waters from Cape Douglas, northwest of the mouth of the Sinuk River, to Point Romanof, a few miles south of Stebbins. The district includes six commercial salmon fishing subdistricts and numerous anadromous streams (Figure 1). The Alaska Department of Fish and Game (ADF&G) operates two counting towers, one weir and one test fish project, and department personnel do numerous aerial surveys to monitor adult salmon escapements in Norton Sound area rivers. In addition, the department assists Kawerak Corporation on four cooperative tower projects and provides assistance to the U.S. Bureau of Land Management on one weir project.

Escapement estimates vary in accuracy by project. Although aerial surveys are the least accurate method, they do allow for a number of river systems to be assessed more economically than other escapement projects. Towers allow on the ground assessments that are more accurate than aerial surveys. Weirs are the most accurate because all fish are counted that pass through the structure. Weirs also provide for a way to live capture salmon for age-sex-length (ASL) sampling.

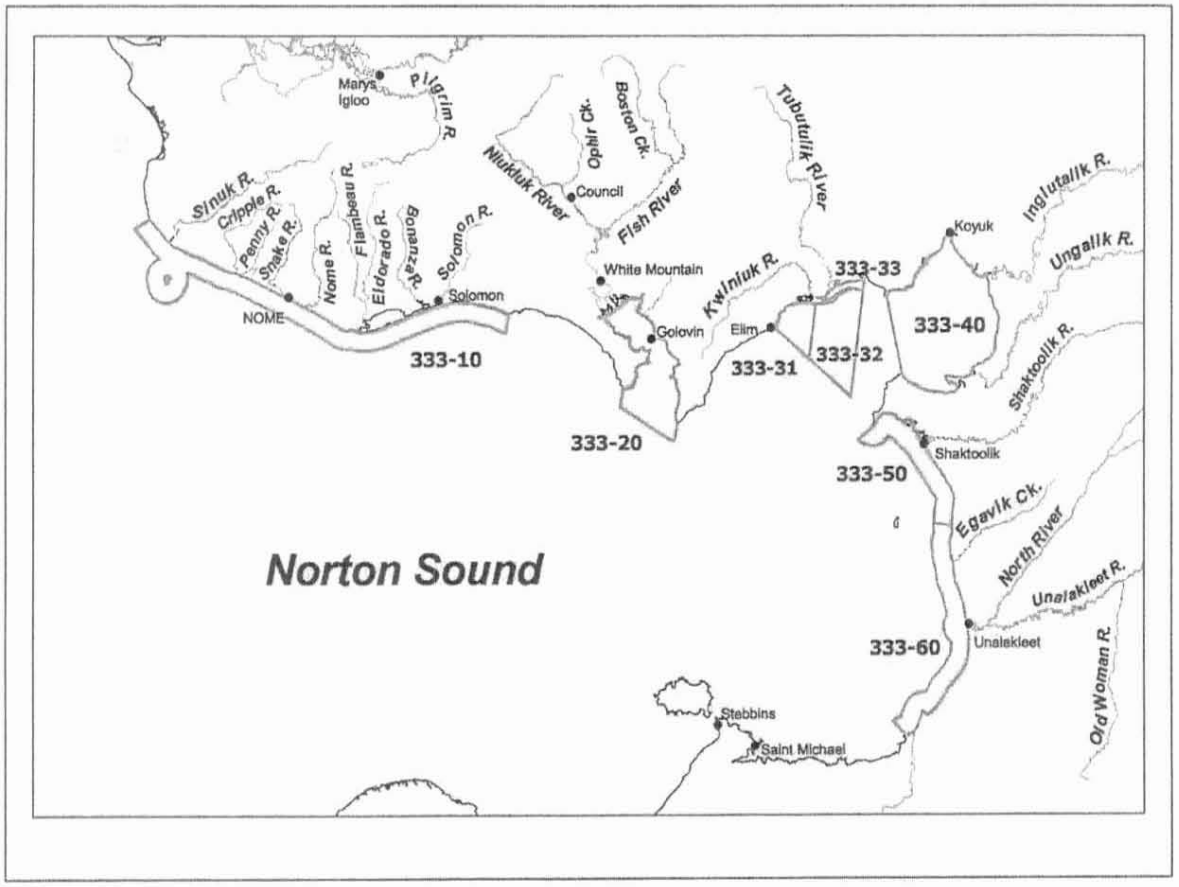

Figure 1. Norton Sound Area Rivers.

The most effective weirs to operate are resistance-board, also known as "floating" weirs. The advantage of resistance-board weirs is that once installed they can withstand high water flows. If the water flow exceeds the limit of a resistance-board weir, the structure does not get washed out as conventional picket and panel weirs do, but rather slips below the water surface and re-floats when water levels subside. This flexibility requires less maintenance by the crew and less time lost counting fish.

Resistance-board weirs operate most effectively in rivers of moderate water depth, from three to four feet, and substrate that has an even profile with sufficient cobble for anchoring the weir. Most resistance-board weirs are operated on rivers with a width at the weir site of 300 feet or less.

METHODS

In the Norton Sound area, a number of rivers where a weir escapement project would be beneficial, were suggested by ADF&G, Kawerak personnel and local residents. Several factors were considered as to which rivers to survey. Selection criteria included rivers that were known salmon producers as observed by aerial survey or Traditional Ecological Knowledge (TEK). Other factors in determining where to survey included rivers that had present escapement projects, substantial subsistence use, and were logistically easy and economical for the crew to reach.

The assessment of sites was done by Rob Stewart, a Fish & Wildlife Technician III, for the ADF&G. Mr. Stewart has constructed eight resistance-board weirs and installed resistance-board weirs on six river systems. He has done numerous site surveys for possible floating weir locations on tributaries of the Yukon River and Kuskokwim River drainages and on tributaries draining into Kuskokwim Bay. Technicians and biologists from the ADF&G, Kawerak Inc., and the Bering Sea Fishermen's Association (BSFA) assisted Mr. Stewart during site surveys.

Surveys of potential resistance-board weir sites occurred on 10 rivers in Norton Sound from July 2 through July 10. The survey crew used a boat with a jet motor to access each river and look for potential sites. When the crew located a potential site, location, measurements of flow, depth, and width were recorded. The location was determined with hand held Global Positioning System (GPS) that was accurate to within 100 meters. Also, if a local landmark was near the site, that was recorded. A tape measure was used to measure the width of the river from the edge of the water to the opposite edge perpendicular to the river flow. A digital current meter was used to measure the river flow at various points from the shore perpendicular to the river flow. Depth was recorded from a tape measure. At sites that appeared favorable to locate a weir, depth and current flow was measured approximately every ten feet in most surveys. Otherwise, depth and current measurements were taken in a few main channel locations of a river.

Observations of the substrate were made and determined as sand, gravel, small to large cobble or bedrock. Sand substrate tends to be a poor anchor for a resistance-board weir. Gravel or small cobble is the preferred substrate in anchoring a resistance-board weir.

Weir sites were rated from poor to very good depending on the potential success of a resistance-board weir as determined by the survey crew; and are independent of costs, or logistics of getting the weir to the site. At sites where there was thought to be a favorable location for a weir, measurement of depth and current were made frequently across the river (Appendices 1 –9) to locate the maximum point flow (MPF) of the current. A river with the MPF greater than 15 cubic feet per second per foot is likely to sink a section of a resistance board weir depending on debris load and other factors.

Cost estimates for the resistance-board weirs were calculated by multiplying the width of the river at the selected site by $160/foot FOB (free on board) Nome (estimated weir material cost). Added to that was $7,000 to build a trap and bulkheads for each weir. Not included in the weir cost is the startup costs for tools and equipment which is approximately $4,000, warehouse rental to build the weir and approximately $30,000 in personnel costs to construct the weir.

RESULTS

Ten rivers were surveyed and data were taken at 23 sites. On four rivers, Tubutulik, Kwiniuk, Sinuk, and Niukluk, there was at least one site that rated as very good as to the potential success of a resistance-board "floating" weir (Table 1). Other rivers surveyed were the Pilgrim, Nome, Eldorado, Snake, Unalakleet, and North.

Unalakleet River

Two sites were surveyed on the Unalakleet River. Site 1 was estimated to be approximately 14 miles from Unalakleet and was rated as good. The water was too high for a depth profile and discharge estimate. This site may be suitable in lower water years. Turbidity was also a possible problem on the Unalakleet River. Site 2, near Sarren's camp, was recommended to the crew because of its shallowness. However, the site may become too shallow during low water to pass fish effectively and the bottom was unstable which would lead to scour if a weir was installed. Therefore, Site 2 was rated as poor.

North River

Two sites were surveyed on the North River. Site 1, near Martin's cabin, approximately 4 miles upstream of the confluence with the Unalakleet River was rated as good for a resistance-board weir (Appendix 1). Site 1 was considered to be very good for a tripod aluminum panel weir. The site could be considered very good for a resistance-board weir, as long as it did not become excessively shallow in which case it would not be able to pass fish effectively. Site 2, the present tower site, was rated as fair because of the soft substrate, which may scour if a weir was installed.

Tubutulik River

Three sites were surveyed on the Tubutulik River. Site 1, located 1 mile above the old tower site was rated as fair because of depth and substrate concerns. Site 2, which was located at river mile 18, was deeper and narrower than site 3, at river mile 20. Site 2 was rated as good and site 3 was rated as very good (Appendix 2), although there was a concern that site 3 might require two counting stations because of the river width there.

Kwiniuk River

One site was surveyed on the Kwiniuk River (Appendix 3). The site was located at river mile 12 and was rated as very good.

Nome River

Two sites were surveyed on the Nome River and both were rated as poor (Appendix 4). However, the two sites were considered good for fixed tripod/aluminum panel weirs.

Snake River

Four sites were surveyed on the Snake River and three of four were rated as poor. However, site 2 and 3 were considered good for fixed tripod/aluminum panel weirs. Site 2 (Appendix 5) was considered a fair site for a resistance-board weir.

Eldorado River

One site was surveyed on the Eldorado River (Appendix 6). The site was located at the present tower site and was rated as poor, but was considered a good site for a fixed panel aluminum panel weir.

Sinuk River

Three sites were surveyed on the Sinuk River. Site 1 was rated fair. The site was considered too high on the drainage and a large percentage of chums would spawn below this site. Site 2, was just above the tidal zone and was considered to have too soft a substrate and was rated poor. Site 3 (Appendix 7), approximately 5.5 miles upstream from the mouth was rated very good, and the crew recommended this as the first floating weir project.

Niukluk River

Three sites were surveyed on the Niukluk River. Site 1 was considered too deep and slow for a resistance-board weir and was rated poor. Site 2 was rated poor as it had various substrates and water would likely divert around the right cutbank. Site 3 (Appendix 8) was located about ½ mile upstream of the current tower site. The site was rated as very good, but because of the boat

traffic the crew thought that it may be a good project in a few years, after more experience with resistance-board weirs is gained by weir crews.

Pilgrim River

Two sites were surveyed on the Pilgrim River. Site 1, was rated as fair. Site 2 (Appendix 9), approximately 6 miles above the Hot Springs was rated as good. The crew thought the site would work well in July, but that it may not be suitable for the higher water that usually occurs in August. The crew thought the left bank (facing downstream) was somewhat loose and unstable, and prone to scour. This could result in eroding the bank and causing weir stability problems.

DISCUSSION

In the initial project proposal the evaluation of project success was to be based on the number of rivers surveyed. The seven primary rivers to be surveyed were the Nome, Snake, Eldorado-Flambeau, Sinuk, Niukluk, North, and Kwiniuk rivers. If time allowed three secondary rivers were to be surveyed which were the Tubutulik, Pilgrim and Shaktoolik rivers. If the seven primary rivers were surveyed then the scoring system would be 100% successful (7/7 x 100%). The three secondary rivers would also be added into the scoring system and possibly result in a greater score than 100%.

Evaluation for the weir sites investigation project was 8.5/7 x 100% = 121%. The Shaktoolik and Flambeau Rivers were not surveyed. The Eldorado and Flambeau Rivers share a common mouth and the Flambeau River was not surveyed because it has a similar substrate and cutbank profile as the nearby Eldorado River. Because no suitable site was found on the Eldorado River, there was expected to be no suitable site on the Flambeau River as a Nome area technician who has been on each river believed surveying the Flambeau River would produce the same results as the Eldorado River. As only the Eldorado River was surveyed of the Eldorado-Flambeau drainage, the scoring system credited 0.5 for the survey on the Eldorado River. The other eight rivers surveyed resulted in a credit of 8 as each river was worth 1 point. The North River is a tributary of the Unalakleet River, and two sites were surveyed on the Unalakleet River. However, no credit was given for surveying the Unalakleet River because it was not in the original proposal.

Of the four river sites receiving a very good rating weir material costs FOB Nome ranged from $25,720 at the Kwiniuk River site number 1 to $52,280 at the Tubutulik River site number 3. To construct each weir approximately $41,000 in labor and other fixed costs would need to be added to the material costs. Transportation costs of the constructed weir from Nome to the river site would also need to be included. Furthermore, another consideration in selecting which weir to construct would be on the distance of the site location from the river mouth. The farther upstream a counting site is from the river's mouth tends to lower the percentage of the escapement into that river that would be counted. Of the four sites rated very good distances from a river's mouth ranged from 5.5 miles on the Sinuk River to 20 miles on the Tubutulik River.

CONCLUSION

Of the four rivers where a site was rated very good, the author would recommend the Sinuk River as the first resistance-board weir project. The second project recommended would be the Pilgrim River, which had a site rated as good. The recommendation for a project to be on the Sinuk or Pilgrim River was because of the favorable rating of the site survey and the limited data on the escapement in each river.

The Kwiniuk River has a tower project that has been operational since 1965 and is located only 3 miles from the river mouth. The potential weir site is located at river mile 12. Because chum salmon spawning occurs below the potential weir site, a determination would have to made as to the number of chums spawning below the weir in order to make the data comparable with estimates from previous years of tower escapement data. However, this project would likely be the most economical because of the smaller length of weir needed.

The Tubutulik River has a potential weir site that is high on drainage and would also have numerous chum salmon spawning below the weir. Also, the higher costs of constructing a longer weir and the logistical expense of getting it on location would make this project the most expensive of those sites that had very good ratings.

The Niukluk River has a tower project that has been operational since 1996. Converting to a weir would allow comparable data. However, there would be high construction costs because of the river width. Transportation costs would be less because the weir materials could be trucked to Council and boated downstream. But, there is significant boat traffic on the Niukluk River when compared to other rivers and it would be advisable to operate the first weir where the traffic over the weir is not as heavy. This would allow weir crews in the area to gain experience with boat passage in lower volume before attempting a weir on the Niukluk River.

The Sinuk River has approximately 20% of the chum salmon escapement and the majority of the sockeye salmon escapement in the Nome Subdistrict. The Sinuk River does not have a counting project, but there is a weir on a tributary to the Sinuk River to count sockeye escapement into Glacial Lake. The potential weir site on the Sinuk River is 5.5 miles from the river mouth. There are some chum salmon that would spawn below the weir site.

Weir construction costs would be higher for the Sinuk River compared to the Kwiniuk River because of the length of the weir. The transportation of the weir panels to the Sinuk River site would require barging from Nome to the Sinuk River mouth and then boating the panels upstream, or slinging the panels with a helicopter.

The Pilgrim River has the largest sockeye escapement in the area. The Pilgrim River is in the Port Clarence District, but can be reached by road from Nome. Fishing effort on this river appears to be increasing, likely because of the fishing restrictions in the Nome Subdistrict. The headwaters of the Pilgrim River are at Salmon Lake and a five-year fertilization project has been

done to provide food for the juvenile salmon rearing in the lake. A counting tower has been operational some years, but has had little success because of turbid water and speciation problems between chum and sockeye salmon.

Construction costs of a weir for the Pilgrim River would be similar to the Sinuk River because both sites have similar widths. The Pilgrim River site is approximately 6 miles downstream of the bridge on the Kougarok Road. The transportation of the weir panels to the site would require trucking to the bridge and boating downstream to the site. Although a weir at this site would count almost all the sockeye salmon, there would be a significant number of chum salmon spawning below the weir.

There was concern expressed that during August, with the usually higher water levels, there might be problems with the riverbank stability. The chum and sockeye run would be nearly complete by August and a decision would have to be made if the project should continue to enumerate the coho salmon run.

Table 1. Norton Sound weir site investigation data summary.

River	Site	Date	Location [a]	Description	Range of Width (ft)	Depth [b] (ft)	Velocity [c] (ft/s)	Substrate	Resistance Board Weir Rating	Cost
Unalakleet	1	7/2/2001	63 53.32' N 160 29.14' W	River Mile 14	300	3 to 4	3 to 4	Gravel with small cobble	Good	$55,000
Unalakleet	2	7/2/2001	63 52.55' N 160 36.81' W	Sarren's Camp	400	2 to 4.5	2 to 3.5	Small Gravel soft in areas	Poor	$71,000
North	1	7/2/2001	63 53.77' N 160 36.77' W	Martin's Camp	148	2	3	Cobble & hard packed sand	Good	$30,680
North	2	7/2/2001	63 53' N [d] 160 39' W	Current Tower Site	150	3	2 to 3	Gravel; soft in areas	Fair	$31,000
Tubutulik	1	7/3/2001	64 50.43' N 162 02.43' W	1 mile upriver from old tower	250	3 to 4.5	4	Sm & Medium Cobble; sand & gravel	Fair	$47,000
Tubutulik	2	7/3/2001	64 50.66' N 162 02.87' W	River Mile 18	270	3 to 4.5	4	Sm & Medium Cobble	Good	$50,200
Tubutulik	3	7/3/2001	64 50.86' N 162 06.82' W	River Mile 20	283	2 to 4	3 to 4	Sm, Med, & Large Cobble	Very Good	$52,280
Kwiniuk	1	7/4/2001	64 46.70' N 162 04.62' W	River Mile 12	117	2 to 3	2 to 4	Sm & Medium Cobble; sand & gravel	Very Good	$25,720
Nome	1	7/5/2001	64 29.81' N 165 13.13' W	Present Weir Site	180	2 to 4	1 to 3	Sm & Medium Cobble; sand & gravel	Poor	$35,800
Nome	2	7/5/2001	64 32.97' N 165 12.91' W	Near Osborn Creek	150	2.5	3 to 4	Med & Large gravel	Poor	$31,000
Snake	1	7/6/2001	64 32.88' N 165 31.09' W		120	2 to 3	2 to 3	Small Gravel	Poor	$26,200
Snake	2	7/6/2001	64 34.38' N 165 29.96' W	3/4 mile upriver from bridge	126	2	1 to 3	Hard Packed Gravel	Fair	$27,160

Continued-

Table 1. (page 2 of 2)

River	Site	Date	Location [a]	Description	Range of Width (ft)	Depth [b] (ft)	Velocity [c] (ft/s)	Substrate	Floating Weir Rating	Cost
Snake	3	7/6/2001	64 31.65' N 165 30.81' W	Tower Site	100	3 to 4	2	Sand	Poor	$23,000
Snake	4	7/6/2001	64 31.18' N 165 28.74' W		150	2 to 4		Sand	Poor	$31,000
Eldorado	1	7/6/2001	64 34.41' N 164 56.24' W	Tower Site	111	2 to 3	1.5 to 3	Small Gravel & Sand	Poor	$24,760
Sinuk	1	7/7/2001	64 40.42' N 166 00.50' W		240	2 to 3.5	3.5	Sm. & Med. Cobble	Fair	$45,400
Sinuk	2	7/7/2001	64 36.57' N 166 12.28' W	Above tidal zone	400	4		Sand & Gravel	Poor	$71,000
Sinuk	3	7/7/2001	64 38.41' N 166 13.17' W	5.5 mile from mouth	237	3 to 4	3.5	Cobble & Gravel	Very Good	$44,920
Niukluk	1	7/8/2001	64 49.38' N 163 28.34' W	Lower river	300	6	2	Sm. Cobble Sand, Gravel	Poor	$55,000
Niukluk	2	7/8/2001	64 49.11' N 163 28.97' W	Mosquito Bar	500	2 to 4.5	2	Large Gravel & Sand	Poor	$87,000
Niukluk	3	7/8/2001	64 49.45' N 163 30.10' W	1/2 mile upriver of tower site	278	2 to 4.5	1 to 3	Med& Lg Gravel & Sand	Very Good	$51,480
Pilgrim	1	7/10/2001	65 06.23' N 164 50.01' W		200	3 to 4.5	2.5	Med Gravel & Sand	Fair/ Good	$39,000
Pilgrim	2	7/10/2001	65 06.17' N 164 49.45' W	6 miles above Hot Springs	219	2.5 to 3	2 to 3	Med Gravel & Sand	Good [e]	$42,040

[a] Location was determined from a hand held Global Positioning System (GPS) that was accurate to within 100 meters.

[b] Depth is a range where the majority of the stream flow occurs.

[c] Velocity is the range most commonly observed at a particular site.

[d] A GPS reading was not recorded at this site and an estimate of the location was made after the survey from a map.

[e] May not be suitable for higher water levels likely during coho season as the left bank is unstable and prone to scour.

Appendix 1. Survey of North River site number 1.

HYDROLOGIC SURVEY

Site NORTH RIVER — Date JULY 2, 2001

Location 63 53.77N 160 36.77W — Crew R. STEWART

River Mi. 4 — Description 300 YARDS UPSTREAM OF MARTIN'S CAMP

Station (String Dist.)	String Dist. correct.	Actual Dist. from bank	Station Depth (ft.)	meter depth	meter Vel.	Substrate Description	Point Flow (DV/1ft.)	Mean Cell Vel.	Mean Cell Depth (ft.)	Cell Width (ft.)	Cell Area (ft.2)	Flow CFS
0	1.02	0	0.00	0.6	0.00	RIVER LEFT BANK	0.00					
10	1.02	10.2	1.40	0.6	3.75		5.25	1.88	0.70	10.2	7.1	13.4
20	1.02	20.4	2.10	0.6	3.57		7.50	3.66	1.75	10.2	17.9	65.3
30	1.02	30.6	2.30	0.6	3.44		7.91	3.51	2.20	10.2	22.4	78.7
40	1.02	40.8	2.10	0.6	3.11		6.53	3.28	2.20	10.2	22.4	73.5
50	1.02	51	1.80	0.6	2.99		5.38	3.05	1.95	10.2	19.9	60.7
60	1.02	61.2	1.70	0.6	2.95		5.02	2.97	1.75	10.2	17.9	53.0
70	1.02	71.4	1.70	0.6	3.10		5.27	3.03	1.70	10.2	17.3	52.5
80	1.02	81.6	1.90	0.6	3.32		6.31	3.21	1.80	10.2	18.4	58.9
90	1.02	91.8	1.80	0.6	3.46		6.23	3.39	1.85	10.2	18.9	64.0
100	1.02	102	1.70	0.6	3.11		5.29	3.29	1.75	10.2	17.9	58.6
110	1.02	112.2	2.10	0.6	3.36		7.06	3.24	1.90	10.2	19.4	62.7
120	1.02	122.4	1.90	0.6	2.90		5.51	3.13	2.00	10.2	20.4	63.9
130	1.02	132.6	1.70	0.6	2.63		4.47	2.77	1.80	10.2	18.4	50.8
140	1.02	142.8	1.30	0.6	1.92		2.50	2.28	1.50	10.2	15.3	34.8
145	1.02	147.9	0.00	0.6	0.00	RIVER RIGHT CUT BANK	0.00	0.96	0.65	5.1	3.3	3.2
							0.00	0.00	0.00	-147.9	0.0	0.0
							0.00	0.00	0.00	0	0.0	0.0
							0.00	0.00	0.00	0	0.0	0.0
							0.00	0.00	0.00	0	0.0	0.0
							0.00	0.00	0.00	0	0.0	0.0
							0.00	0.00	0.00	0	0.0	0.0
							0.00	0.00	0.00	0	0.0	0.0
							0.00	0.00	0.00	0	0.0	0.0
							0.00	0.00	0.00	0	0.0	0.0
							0.00	0.00	0.00	0	0.0	0.0
							0.00	0.00	0.00	0	0.0	0.0
							0.00	0.00	0.00	0	0.0	0.0
							0.00	0.00	0.00	0	0.0	0.0
							0.00	0.00	0.00	0	0.0	0.0

Depth		Velocity		**Max. Point Flow**
Average	1.70 ft	Average	2.73 ft/sec	7.91
Maximum	2.30 ft	Max.	3.75 ft/sec	SITE RATING, FIXED PICKET **VERY GOOD**
				RESISTANCE BOARD WEIR **GOOD**

Notes: Flow data represented here are for Resistance Board Weir Site Survey purposes only.
These data are not meant to depict a precise stream discharge.

Point flow of 15 CFS/ft. is an index at which a section of resistance board weir may sink, depending on debris load and other factors.

Appendix 2. Survey of Tubutulik River site number 3.

HYDROLOGIC SURVEY

Site TUBUTULIK RIVER Date JULY 3, 2001

Location 64 50.86N 162 06.82W Crew R. STEWART

River Mi. 20 Description RIVER EXITS MOUNTAINS, WIDE AND SHALLOW, JUST ABOVE A SMALL ISLAND

Station (String Dist.)	String Dist. correct.	Actual Dist. from bank	Station Depth (ft.)	meter depth	meter Vel.	Substrate Description	Point Flow (DV/1ft.)	Mean Cell Vel.	Mean Cell Depth (ft.)	Cell Width (ft.)	Cell Area (ft.2)	Flow CFS
0	1	0	0.00	0.6	0.00	RIVER RIGHT BANK	0.00					
8	1	8	2.30	0.6	3.70		8.51	1.85	1.15	8	9.2	17.0
18	1	18	2.30	0.6	4.01		9.22	3.86	2.30	10	23.0	88.7
28	1	28	2.70	0.6	3.67		9.91	3.84	2.50	10	25.0	96.0
38	1	38	2.60	0.6	3.20		8.32	3.44	2.65	10	26.5	91.0
48	1	48	2.40	0.6	3.06		7.34	3.13	2.50	10	25.0	78.3
58	1	58	2.50	0.6	3.57		8.93	3.32	2.45	10	24.5	81.2
68	1	68	2.60	0.6	3.16		8.22	3.37	2.55	10	25.5	85.8
78	1	78	2.60	0.6	3.07		7.98	3.12	2.60	10	26.0	81.0
88	1	88	2.40	0.6	2.85		6.84	2.96	2.50	10	25.0	74.0
98	1	98	2.50	0.6	2.96		7.40	2.91	2.45	10	24.5	71.2
108	1	108	2.50	0.6	2.73		6.83	2.85	2.50	10	25.0	71.1
118	1	118	2.60	0.6	3.03		7.88	2.88	2.55	10	25.5	73.4
128	1	128	2.70	0.6	3.38		9.13	3.21	2.65	10	26.5	84.9
138	1	138	2.80	0.6	3.63		10.16	3.51	2.75	10	27.5	96.4
148	1	148	2.80	0.6	3.56		9.97	3.60	2.80	10	28.0	100.7
158	1	158	2.90	0.6	4.09		11.86	3.83	2.85	10	28.5	109.0
168	1	168	2.80	0.6	4.10		11.48	4.10	2.85	10	28.5	116.7
178	1	178	3.00	0.6	4.19		12.57	4.15	2.90	10	29.0	120.2
188	1	188	2.90	0.6	4.17		12.09	4.18	2.95	10	29.5	123.3
198	1	198	2.60	0.6	3.86		10.04	4.02	2.75	10	27.5	110.4
208	1	208	2.60	0.6	3.90		10.14	3.88	2.60	10	26.0	100.9
218	1	218	2.90	0.6	3.72		10.79	3.81	2.75	10	27.5	104.8
228	1	228	2.90	0.6	3.64		10.56	3.68	2.90	10	29.0	106.7
238	1	238	3.00	0.6	3.48		10.44	3.56	2.95	10	29.5	105.0
248	1	248	3.30	0.6	3.15		10.40	3.32	3.15	10	31.5	104.4
258	1	258	3.60	0.6	3.43		12.35	3.29	3.45	10	34.5	113.5
268	1	268	3.90	0.6	3.44		13.42	3.44	3.75	10	37.5	128.8
278	1	278	3.30	0.6	3.02		9.97	3.23	3.60	10	36.0	116.3
283	1	283	0.00	0.6	0.00	RIVER LEFT BANK	0.00	1.51	1.65	5	8.3	12.5

Depth		Velocity		**Max. Point Flow**	
Average	2.69 ft	Average	3.26 ft/sec	13.42	
Maximum	3.90 ft	Max.	4.19 ft/sec	SITE RATING:	**VERY GOOD**

Notes: Flow data represented here are for Resistance Board Weir Site Survey purposes only.
These data are not meant to depict a precise stream discharge.

Point flow of 15 CFS/ft. is an index at which a section of resistance board weir may sink, depending on debris load and other factors.

Appendix 3. Survey of Kwiniuk River site number 1.

HYDROLOGIC SURVEY

Site KWINIUK RIVER　　Date JULY 4, 2001

Location 64 46.70N 162 04.62W　　Crew R. STEWART, L. NEFF

River Mi. 12　　Description

Station (String Dist.)	String Dist. correct.	Actual Dist. from bank	Station Depth (ft.)	meter depth	meter Vel.	Substrate Description	Point Flow (DV/1ft.)	Mean Cell Vel.	Mean Cell Depth (ft.)	Cell Width (ft.)	Cell Area (ft.2)	Flow CFS
RT. BANK	1.013		0.00	0.6	0.00	RIVER RIGHT BANK	0.00					
10	1.013	10.13	3.00	0.6	3.89		11.67	1.95	1.50			
20	1.013	20.26	3.00	0.6	3.97		11.91	3.93	3.00	10.13	30.4	119.4
30	1.013	30.39	2.90	0.6	3.72		10.79	3.85	2.95	10.13	29.9	114.9
40	1.013	40.52	2.90	0.6	3.55		10.30	3.64	2.90	10.13	29.4	106.8
50	1.013	50.65	2.90	0.6	3.77		10.93	3.66	2.90	10.13	29.4	107.5
60	1.013	60.78	2.80	0.6	4.11		11.51	3.94	2.85	10.13	28.9	113.7
70	1.013	70.91	2.70	0.6	3.89		10.50	4.00	2.75	10.13	27.9	111.4
80	1.013	81.04	2.70	0.6	4.32		11.66	4.11	2.70	10.13	27.4	112.3
90	1.013	91.17	2.70	0.6	4.09		11.04	4.21	2.70	10.13	27.4	115.0
100	1.013	101.3	2.50	0.6	3.81		9.53	3.95	2.60	10.13	26.3	104.0
110	1.013	111.43	1.90	0.6	1.77		3.36	2.79	2.20	10.13	22.3	62.2
115	1.013	116.5	0.00	0.6	0.00	RIVER LEFT BANK	0.00	0.89	0.95	5.065	4.8	4.3
		0					0.00	0.00	0.00	-116.5	0.0	0.0
		0					0.00	0.00	0.00	0	0.0	0.0
		0					0.00	0.00	0.00	0	0.0	0.0
		0					0.00	0.00	0.00	0	0.0	0.0
		0					0.00	0.00	0.00	0	0.0	0.0
		0					0.00	0.00	0.00	0	0.0	0.0
		0					0.00	0.00	0.00	0	0.0	0.0
		0					0.00	0.00	0.00	0	0.0	0.0
		0					0.00	0.00	0.00	0	0.0	0.0
		0					0.00	0.00	0.00	0	0.0	0.0
		0					0.00	0.00	0.00	0	0.0	0.0
		0					0.00	0.00	0.00	0	0.0	0.0
		0					0.00	0.00	0.00	0	0.0	0.0
		0					0.00	0.00	0.00	0	0.0	0.0
		0					0.00	0.00	0.00	0	0.0	0.0
		0					0.00	0.00	0.00	0	0.0	0.0
		0					0.00	0.00	0.00	0	0.0	0.0

Depth		Velocity		Max. Point Flow
Average	2.50 ft	Average	3.15 ft/sec	11.91
Maximum	3.00 ft	Max.	4.32 ft/sec	SITE RATING: **VERY GOOD**

Notes: Flow data represented here are for Resistance Board Weir Site Survey purposes only.
These data are not meant to depict a precise stream discharge.

Point flow of 15 CFS/ft. is an index at which a section of resistance board weir may sink, depending on debris load and other factors.

Appendix 4. Survey of Nome River site number 1.

HYDROLOGIC SURVEY

Site NOME RIVER Date JULY 5, 2001

Location 2001 WEIR SITE (64 29.81' N 165 13.13' W) Crew R. STEWART, A. CORCORAN

River Mi. _____ Description WATER TOO HIGH FOR WEIR INSTALATION

Station (String Dist.)	String Dist. correct.	Actual Dist. from bank	Station Depth (ft.)	meter depth	meter Vel.	Substrate Description	Point Flow (DV/1ft.)	Mean Cell Vel.	Mean Cell Depth (ft.)	Cell Width (ft.)	Cell Area (ft.2)	Flow CFS
0	1.018	0	0.00		0.00	RIVER RIGHT BANK	0.00		1.40		4.3	
3	1.018	3.054	2.80	0.6	0.00	SILT/SAND	0.00	0.00	2.65	3.054	27.0	0.0
13	1.018	13.234	2.50	0.6	0.96	SAND	2.40	0.48	2.30	10.18	23.4	11.2
23	1.018	23.414	2.10	0.6	1.16	FINE SAND	2.44	1.06	2.15	10.18	21.9	23.2
33	1.018	33.594	2.20	0.6	1.50	FINE SAND	3.30	1.33	2.15	10.18	21.9	29.1
43	1.018	43.774	2.10	0.6	1.83	MED SAND	3.84	1.67	2.15	10.18	21.9	36.4
53	1.018	53.954	2.20	0.6	1.88	SAND/PEA GRAVEL	4.14	1.86	2.20	10.18	22.4	41.5
63	1.018	64.134	2.20	0.6	2.15	PEA GRAVEL	4.73	2.02	2.30	10.18	23.4	47.2
73	1.018	74.314	2.40	0.6	2.26	SAND/GRAVEL	5.42	2.21	2.45	10.18	24.9	55.0
83	1.018	84.494	2.50	0.6	2.40	SAND/GRAVEL	6.00	2.33	2.60	10.18	26.5	61.7
93	1.018	94.674	2.70	0.2	2.08	SMALL GRAVEL	5.62	2.24	2.70	10.18	0.0	0.0
93	1.018	94.674	2.70	0.8	2.69	SMALL GRAVEL	7.26	2.39	2.70	0	27.5	65.6
103	1.018	104.85	2.70	0.2	2.22	SMALL GRAVEL	5.99	2.46	2.70	10.18	0.0	0.0
103	1.018	104.85	2.70	0.8	2.61	SMALL GRAVEL	7.05	2.42	2.90	0	29.5	71.3
113	1.018	115.03	3.10	0.2	2.28	SMALL GRAVEL	7.07	2.45	3.10	10.18	0.0	0.0
113	1.018	115.03	3.10	0.8	2.73	SMALL GRAVEL	8.46	2.51	3.25	0	33.1	82.9
123	1.018	125.21	3.40	0.2	2.32	SMALL GRAVEL	7.89	2.53	3.40	10.18	0.0	0.0
123	1.018	125.21	3.40	0.8	2.59	SMALL GRAVEL	8.81	2.46	3.55	0	36.1	88.7
133	1.018	135.39	3.70	0.2	2.01	MEDIUM GRAVEL	7.44	2.30	3.70	10.18	0.0	0.0
133	1.018	135.39	3.70	0.8	2.81	MEDIUM GRAVEL	10.40	2.41	3.80	0	38.7	93.2
143	1.018	145.57	3.90	0.2	2.23	MEDIUM GRAVEL	8.70	2.52	3.90	10.18	0.0	0.0
143	1.018	145.57	3.90	0.8	2.72	MEDIUM GRAVEL	10.61	2.48	3.85	0	39.2	97.0
153	1.018	155.75	3.80	0.2	2.19	MEDIUM GRAVEL	8.32	2.46	3.80	10.18	0.0	0.0
153	1.018	155.75	3.80	0.8	2.60	MEDIUM GRAVEL	9.88	2.40	3.65	0	37.2	89.0
163	1.018	165.93	3.50	0.2	1.88	MEDIUM GRAVEL	6.58	2.24	3.50	10.18	0.0	0.0
163	1.018	165.93	3.50	0.8	2.38	MEDIUM GRAVEL	8.33	2.13	3.20	0	32.6	69.4
173	1.018	176.11	2.90	0.2	1.26	MEDIUM GRAVEL	3.65	1.82	2.90	10.18	0.0	0.0
173	1.018	176.11	2.90	0.8	1.39	MEDIUM GRAVEL	4.03	1.33	1.45	0	5.9	7.8
177	1.018	180.19	0.00		0.00	RIVER LEFT BANK	0.00	0.70	0.00	4.072	0.0	0.0
		0					0.00	0.00		-180.2		

Depth		Velocity		**Max. Point Flow**
Average	2.87 ft	Average	1.90 ft/sec	10.61
Maximum	3.90 ft	Max.	2.81 ft/sec	SITE RATING, FIXED PICKET **FAIR**
				RESISTANCE BOARD WEIR **POOR**

Notes: Flow data represented here are for Resistance Board Weir Site Survey purposes only.
These data are not meant to depict a precise stream discharge.

Point flow of 15 CFS/ft. is an index at which a section of resistance board weir may sink, depending on debris load and other factors.

Appendix 5. Survey of Snake River site number 2.

HYDROLOGIC SURVEY

Site SNAKE RIVER — Date JULY 6, 2001

Location 64 34.38N 165 29.96W — Crew R. STEWART, A. CORCORAN

River Mi. ______ Description ABOUT 3/4 MI UPSTREAM OF BRIDGE

Station (String Dist.)	String Dist. correct.	Actual Dist. from bank	Station Depth (ft.)	meter depth	meter Vel.	Substrate Description	Point Flow (DV/1ft.)	Mean Cell Vel.	Mean Cell Depth (ft.)	Cell Width (ft.)	Cell Area (ft.2)	Flow CFS
0	1	0	0.00	0.6	0.00	RIVER LEFT BANK	0.00		0.90		9.0	
10	1	10	1.80	0.6	1.63	MEDIUM GRAVEL	2.93	0.82	1.85	10	18.5	15.1
20	1	20	1.90	0.6	1.72	MEDIUM GRAVEL	3.27	1.68	1.90	10	19.0	31.8
30	1	30	1.90	0.6	2.52	MEDIUM GRAVEL	4.79	2.12	2.00	10	20.0	42.4
40	1	40	2.10	0.6	2.91	MEDIUM GRAVEL	6.11	2.72	2.15	10	21.5	58.4
50	1	50	2.20	0.6	3.18	MEDIUM GRAVEL	7.00	3.05	2.20	10	22.0	67.0
60	1	60	2.20	0.6	2.70	MEDIUM GRAVEL	5.94	2.94	2.10	10	21.0	61.7
70	1	70	2.00	0.6	2.47	MEDIUM GRAVEL	4.94	2.59	1.95	10	19.5	50.4
80	1	80	1.90	0.6	2.28	MEDIUM GRAVEL	4.33	2.38	1.55	10	15.5	36.8
90	1	90	1.20	0.6	2.24	MEDIUM GRAVEL	2.69	2.26	1.00	10	10.0	22.6
100	1	100	0.80	0.6	1.94	SAND AND GRAVEL	1.55	2.09	1.25	10	12.5	26.1
110	1	110	1.70	0.6	1.27	SAND	2.16	1.61	2.00	10	20.0	32.1
120	1	120	2.30	0.6	1.55	SAND	3.57	1.41	1.15	10	6.9	9.7
126	1	126	0.00	0.6	0.00	RIVER RIGHT BANK	0.00	0.78	0.00	6	0.0	0.0
		0					0.00	0.00	0.00	-126	0.0	0.0
		0					0.00	0.00	0.00	0	0.0	0.0
		0					0.00	0.00	0.00	0	0.0	0.0
		0					0.00	0.00	0.00	0	0.0	0.0
		0					0.00	0.00	0.00	0	0.0	0.0
		0					0.00	0.00	0.00	0	0.0	0.0
		0					0.00	0.00	0.00	0	0.0	0.0
		0					0.00	0.00	0.00	0	0.0	0.0
		0					0.00	0.00	0.00	0	0.0	0.0
		0					0.00	0.00	0.00	0	0.0	0.0
		0					0.00	0.00	0.00	0	0.0	0.0
		0					0.00	0.00	0.00	0	0.0	0.0
		0					0.00	0.00	0.00	0	0.0	0.0
		0					0.00	0.00	0.00	0	0.0	0.0
		0					0.00	0.00	0.00	0	0.0	0.0
		0					0.00	0.00		0	0.0	0.0

Depth		Velocity		Max. Point Flow
Average	1.69 ft	Average	1.89 ft/sec	7.00
Maximum	2.30 ft	Max.	3.18 ft/sec	SITE RATING, FIXED PICKET **GOOD**
				RESISTANCE BOARD WEIR **FAIR**

Notes: Flow data represented here are for Resistance Board Weir Site Survey purposes only.
These data are not meant to depict a precise stream discharge.

Point flow of 15 CFS/ft. is an index at which a section of resistance board weir may sink, depending on debris load and other factors.

Appendix 6. Survey of Eldorado River site number 1.

HYDROLOGIC SURVEY

Site ELDORADO RIVER Date JULY 11, 2001

Location 64 34.41N 164 56.24W Crew R. STEWART P. ROBB

River Mi. ______ Description ABOUT 50 FT UPSTREAM OF THE TOWER SITE

Station (String Dist.)	String Dist. correct.	Actual Dist. from bank	Station Depth (ft.)	meter depth	meter Vel.	Substrate Description	Point Flow (DV/1ft.)	Mean Cell Vel.	Mean Cell Depth (ft.)	Cell Width (ft.)	Cell Area (ft.2)	Flow CFS
0	1.0083	0	0.00		0.00	RIVER LEFT BANK	0.00		1.55		15.6	
10	1.0083	10.083	3.10	0.2	1.32	SMALL GRAVEL	4.09	0.66	3.10	10.083	0.0	0.0
10	1.0083	10.083	3.10	0.8	2.41	SMALL GRAVEL	7.47	1.87	2.60	0	26.2	48.9
20	1.0083	20.166	2.10	0.6	2.34	SMALL GRAVEL	4.91	2.38	2.15	10.083	21.7	51.5
30	1.0083	30.249	2.20	0.6	2.52	SMALL GRAVEL	5.54	2.43	2.35	10.083	23.7	57.6
40	1.0083	40.332	2.50	0.6	2.83	SMALL GRAVEL	7.08	2.68	2.50	10.083	25.2	67.4
50	1.0083	50.415	2.50	0.6	2.77	SMALL GRAVEL	6.93	2.80	2.60	10.083	26.2	73.4
60	1.0083	60.498	2.70	0.6	2.69	SMALL GRAVEL	7.26	2.73	2.55	10.083	25.7	70.2
70	1.0083	70.581	2.40	0.6	2.65	SMALL GRAVEL	6.36	2.67	2.25	10.083	22.7	60.6
80	1.0083	80.664	2.10	0.6	1.88	SAND AND PEA GRAVEL	3.95	2.27	1.90	10.083	19.2	43.4
90	1.0083	90.747	1.70	0.6	2.16	SAND AND PEA GRAVEL	3.67	2.02	1.65	10.083	16.6	33.6
100	1.0083	100.83	1.60	0.6	1.62	SAND (SOFT)	2.59	1.89	0.80	10.083	8.1	15.2
110	1.0083	110.91	0.00		0.00	RIVER RIGHT BANK	0.00	0.81	0.00	10.083	0.0	0.0
		0					0.00	0.00	0.00	-110.9	0.0	0.0
		0					0.00	0.00	0.00	0	0.0	0.0
		0					0.00	0.00	0.00	0	0.0	0.0
		0					0.00	0.00	0.00	0	0.0	0.0
		0					0.00	0.00	0.00	0	0.0	0.0
		0					0.00	0.00	0.00	0	0.0	0.0
		0					0.00	0.00	0.00	0	0.0	0.0
		0					0.00	0.00	0.00	0	0.0	0.0
		0					0.00	0.00	0.00	0	0.0	0.0
		0					0.00	0.00	0.00	0	0.0	0.0
		0					0.00	0.00	0.00	0	0.0	0.0
		0					0.00	0.00	0.00	0	0.0	0.0
		0					0.00	0.00	0.00	0	0.0	0.0
		0					0.00	0.00	0.00	0	0.0	0.0
		0					0.00	0.00	0.00	0	0.0	0.0
		0					0.00	0.00	0.00	0	0.0	0.0
		0					0.00	0.00		0	0.0	0.0

Depth		Velocity		**Max. Point Flow**
Average	2.17 ft	Average	1.94 ft/sec	7.47
Maximum	3.10 ft	Max.	2.83 ft/sec	SITE RATING, FIXED PICKET **GOOD**
				RESISTANCE BOARD WEIR **POOR**

Notes: Flow data represented here are for Resistance Board Weir Site Survey purposes only.
These data are not meant to depict a precise stream discharge.

Point flow of 15 CFS/ft. is an index at which a section of resistance board weir may sink, depending on debris load and other factors.

Appendix 7. Survey of Sinuk River site number 3.

HYDROLOGIC SURVEY

Site SINUK RIVER Date JULY 12, 2001

Location 64 38.41N 166 13.17W Crew R. STEWART, S. PRUFER

River Mi. 5.5 Description APPROX 500 YARDS DOWNSTREAM OF A REG. MARKER ON RIVER RIGHT BLUFF

Station (String Dist.)	String Dist. correct.	Actual Dist. from bank	Station Depth (ft.)	meter depth	meter Vel.	Substrate Description	Point Flow (DV/1ft.)	Mean Cell Vel.	Mean Cell Depth (ft.)	Cell Width (ft.)	Cell Area (ft.2)	Flow CFS
0	1.0083	0	0.00			RIVER RT ROCK BLUFF	0.00		1.65		16.6	
10	1.0083	10.083	3.30			LARGE COBLE & SMALLER	0.00	0.00	3.25	10.083	32.8	0.0
20	1.0083	20.166	3.20			SOME SMALL BOULDERS	0.00	0.00	3.05	10.083	30.8	0.0
30	1.0083	30.249	2.90				0.00	0.00	2.85	10.083	28.7	0.0
40	1.0083	40.332	2.80			LARGE GRAVEL AND SAND	0.00	0.00	2.90	10.083	29.2	0.0
50	1.0083	50.415	3.00			MIXED GRAVEL	0.00	0.00	3.15	10.083	31.8	0.0
60	1.0083	60.498	3.30			MEDIUM GRAVEL	0.00	0.00	3.35	10.083	33.8	0.0
70	1.0083	70.581	3.40			LARGE GRAVEL	0.00	0.00	3.55	10.083	35.8	0.0
80	1.0083	80.664	3.70			LG GRAVEL / SM COBBLE	0.00	0.00	3.75	10.083	37.8	0.0
90	1.0083	90.747	3.80			LG GRAVEL / SM COBBLE	0.00	0.00	3.90	10.083	39.3	0.0
100	1.0083	100.83	4.00			LG GRAVEL / SM COBBLE	0.00	0.00	3.95	10.083	39.8	0.0
110	1.0083	110.91	3.90			LG GRAVEL / SM COBBLE	0.00	0.00	3.95	10.083	39.8	0.0
120	1.0083	121	4.00			LG GRAVEL / SM COBBLE	0.00	0.00	4.00	10.083	40.3	0.0
130	1.0083	131.08	4.00	0.6	3.50	LG GRAVEL / SM COBBLE	14.00	1.75	4.00	10.083	40.3	70.6
140	1.0083	141.16	4.00			MIXED GRAVEL	0.00	1.75	3.90	10.083	39.3	68.8
150	1.0083	151.25	3.80			MIXED GRAVEL	0.00	0.00	3.60	10.083	36.3	0.0
160	1.0083	161.33	3.40			MIXED GRAVEL	0.00	0.00	3.30	10.083	33.3	0.0
170	1.0083	171.41	3.20			MIXED GRAVEL	0.00	0.00	3.10	10.083	31.3	0.0
180	1.0083	181.49	3.00			MIXED GRAVEL	0.00	0.00	2.90	10.083	29.2	0.0
190	1.0083	191.58	2.80			MIXED GRAVEL AND SAND	0.00	0.00	2.50	10.083	25.2	0.0
200	1.0083	201.66	2.20			MIXED GRAVEL AND SAND	0.00	0.00	1.85	10.083	18.7	0.0
210	1.0083	211.74	1.50			MIXED GRAVEL AND SAND	0.00	0.00	1.25	10.083	12.6	0.0
220	1.0083	221.83	1.00			MIXED GRAVEL AND SAND	0.00	0.00	0.90	10.083	9.1	0.0
230	1.0083	231.91	0.80			MIXED GRAVEL AND SAND	0.00	0.00	0.40	10.083	2.0	0.0
235	1.0083	236.95	0.00			RIVER LEFT IS A WELL	0.00	0.00	0.00	5.0415	0.0	0.0
		0				VEGETATED GRAVEL BAR	0.00	0.00	0.00	-237	0.0	0.0
		0					0.00	0.00	0.00	0	0.0	0.0
		0					0.00	0.00	0.00	0	0.0	0.0
		0					0.00	0.00	0.00	0	0.0	0.0
		0					0.00	0.00		0	0.0	0.0

Depth		Velocity		Max. Point Flow	
Average	2.96 ft	Average	3.50 ft/sec	14.00	
Maximum	4.00 ft	Max.	3.50 ft/sec	SITE RATING:	**VERY GOOD**

Notes: Flow data represented here are for Resistance Board Weir Site Survey purposes only. These data are not meant to depict a precise stream discharge.

Flow was too great for a proper discharge at this site. Velocity at the thalweg was 3.5 ft./sec.

Point flow of 15 CFS/ft. is an index at which a section of resistance board weir may sink, depending on debris load and other factors.

Appendix 8. Survey of Niukluk River site number 3.

HYDROLOGIC SURVEY

Site: NIUKLUK RIVER | Date: JULY 8 2001

Location: 64 49.45N, 163 30.10W | Crew: R. STEWART, P. ROBB

River Mi. ______ Description: ABOUT 1/2 MI UPSTREAM OF 2001 TOWER SITE

Station (String Dist.)	String Dist. correct.	Actual Dist. from bank	Station Depth (ft.)	meter depth	meter Vel.	Substrate Description	Point Flow (DV/1ft.)	Mean Cell Vel.	Mean Cell Depth (ft.)	Cell Width (ft.)	Cell Area (ft.2)	Flow CFS
0	1.03	0	0.00		0.00	RIVER LEFT IS A SPARCELY	0.00		0.40		8.2	
20	1.03	20.6	0.80	0.6	1.92	VEGETATED GRAVEL BAR	1.54	0.96	1.60	20.6	49.4	47.5
50	1.03	51.5	2.40	0.6	3.41		8.18	2.67	2.65	30.9	54.6	145.5
70	1.03	72.1	2.90	0.6	3.99		11.57	3.70	3.10	20.6	95.8	354.4
100	1.03	103	3.30	0.6	4.09		13.50	4.04	3.20	30.9	98.9	399.5
130	1.03	133.9	3.10	0.6	3.93		12.18	4.01	3.00	30.9	61.8	247.8
150	1.03	154.5	2.90	0.6	4.29		12.44	4.11	2.80	20.6	86.5	355.6
180	1.03	185.4	2.70	0.6	4.05		10.94	4.17	2.55	30.9	78.8	328.6
210	1.03	216.3	2.40	0.6	3.94		9.46	4.00	2.15	30.9	88.6	353.9
250	1.03	257.5	1.90	0.6	2.87		5.45	3.41	2.15	41.2	26.6	90.5
262	1.03	269.86	2.40	0.6	2.38		5.71	2.63	1.20	12.36	9.9	26.0
270	1.03	278.1	0.00		0.00	RIVER RIGHT IS A BANK	0.00	1.19	0.00	8.24	0.0	0.0
		0				WITH COTTONWOOD STAND	0.00	0.00	0.00	-278.1	0.0	0.0
		0					0.00	0.00	0.00	0	0.0	0.0
		0					0.00	0.00	0.00	0	0.0	0.0
		0					0.00	0.00	0.00	0	0.0	0.0
		0					0.00	0.00	0.00	0	0.0	0.0
		0					0.00	0.00	0.00	0	0.0	0.0
		0					0.00	0.00	0.00	0	0.0	0.0
		0					0.00	0.00	0.00	0	0.0	0.0
		0					0.00	0.00	0.00	0	0.0	0.0
		0					0.00	0.00	0.00	0	0.0	0.0
		0					0.00	0.00	0.00	0	0.0	0.0
		0					0.00	0.00	0.00	0	0.0	0.0
		0					0.00	0.00	0.00	0	0.0	0.0
		0					0.00	0.00	0.00	0	0.0	0.0
		0					0.00	0.00	0.00	0	0.0	0.0
		0					0.00	0.00	0.00	0	0.0	0.0
		0					0.00	0.00	0.00	0	0.0	0.0
		0					0.00	0.00		0	0.0	0.0

Depth		Velocity		Max. Point Flow	
Average	2.25 ft	Average	2.91 ft/sec	13.50	
Maximum	3.30 ft	Max.	4.29 ft/sec	SITE RATING:	**VERY GOOD**

Notes: Flow data represented here are for Resistance Board Weir Site Survey purposes only.
These data are not meant to depict a precise stream discharge.

Point flow of 15 CFS/ft. is an index at which a section of resistance board weir may sink, depending on debris load and other factors.

Preferable weir site was not wadable, a rough discharge was taken where the river shallows about 500 ft. upstream.

Appendix 9. Survey of Pilgrim River site number 2.

HYDROLOGIC SURVEY

Site PILGRIM RIVER | Date JULY 7, 2001

Location 65 06.17N, 164 49.45W | Crew R. STEWART, A. CORCORAN

River Mi. ______ Description 5.5 MILES BELOW BRIGE, 6 MILES ABOVE HOTSPRINGS

Station (String Dist.)	String Dist. correct.	Actual Dist. from bank	Station Depth (ft.)	meter depth	meter Vel.	Substrate Description	Point Flow (DV/1ft.)	Mean Cell Vel.	Mean Cell Depth (ft.)	Cell Width (ft.)	Cell Area (ft.2)	Flow CFS
0	1	0	0.00		0.00	RIVER LEFT, GRAVEL BAR	0.00		1.50		19.5	
13	1	13	3.00	0.2	1.70	MEDIUM GRAVEL	5.10	0.85	3.00	13	0.0	0.0
13	1	13	3.00	0.8	2.46		7.38	2.08	3.00	0	60.0	124.8
33	1	33	3.00	0.2	2.39	MIXED GRAVEL	7.17	2.43	3.00	20	0.0	0.0
33	1	33	3.00	0.8	3.05		9.15	2.72	2.75	0	82.5	224.4
63	1	63	2.50	0.6	2.79	MIXED GRAVEL & SAND	6.98	2.92	2.40	30	72.0	210.2
93	1	93	2.30	0.6	2.81		6.46	2.80	2.35	30	70.5	197.4
123	1	123	2.40	0.6	2.73		6.55	2.77	2.80	30	56.0	155.1
143	1	143	3.20	0.2	2.26	SOME LARGE GRAVEL	7.23	2.50	3.20	20	0.0	0.0
143	1	143	3.20	0.8	3.14		10.05	2.70	2.75	0	82.5	222.8
173	1	173	2.30	0.6	2.53		5.82	2.84	1.95	30	39.0	110.6
193	1	193	1.60	0.6	2.02	MIXED GRAVEL (HARD)	3.23	2.28	1.25	20	25.0	56.9
213	1	213	0.90	0.6	1.30		1.17	1.66	0.45	20	2.7	4.5
219	1	219	0.00		0.00	RIVER RIGHT IS A WELL	0.00	0.65	0.00	6	0.0	0.0
		0				VEGETATED GRAVEL BAR	0.00	0.00	0.00	-219	0.0	0.0
		0					0.00	0.00	0.00	0	0.0	0.0
		0					0.00	0.00	0.00	0	0.0	0.0
		0					0.00	0.00	0.00	0	0.0	0.0
		0					0.00	0.00	0.00	0	0.0	0.0
		0					0.00	0.00	0.00	0	0.0	0.0
		0					0.00	0.00	0.00	0	0.0	0.0
		0					0.00	0.00	0.00	0	0.0	0.0
		0					0.00	0.00	0.00	0	0.0	0.0
		0					0.00	0.00	0.00	0	0.0	0.0
		0					0.00	0.00	0.00	0	0.0	0.0
		0					0.00	0.00	0.00	0	0.0	0.0
		0					0.00	0.00	0.00	0	0.0	0.0
		0					0.00	0.00	0.00	0	0.0	0.0
		0					0.00	0.00	0.00	0	0.0	0.0
		0					0.00	0.00		0	0.0	0.0

Depth		Velocity		Max. Point Flow	
Average	2.34 ft	Average	2.08 ft/sec	10.05	
Maximum	3.20 ft	Max.	3.14 ft/sec	SITE RATING:	**GOOD**

Notes: Flow data represented here are for Resistance Board Weir Site Survey purposes only.
These data are not meant to depict a precise stream discharge.

Point flow of 15 CFS/ft. is an index at which a section of resistance board weir may sink, depending on debris load and other factors.